

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
11 November 2004 (11.11.2004)

PCT

(10) International Publication Number
WO 2004/096381 A1

(51) International Patent Classification⁷: A63B 69/24, 69/20, 69/30, 69/34

(21) International Application Number:
PCT/AU2004/000566

(22) International Filing Date: 29 April 2004 (29.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2003902010 29 April 2003 (29.04.2003) AU

(71) Applicant and

(72) Inventor: STEVENSON, Leon [AU/AU]; 17 York Avenue, Clovelly Park, South Australia 5042 (AU).

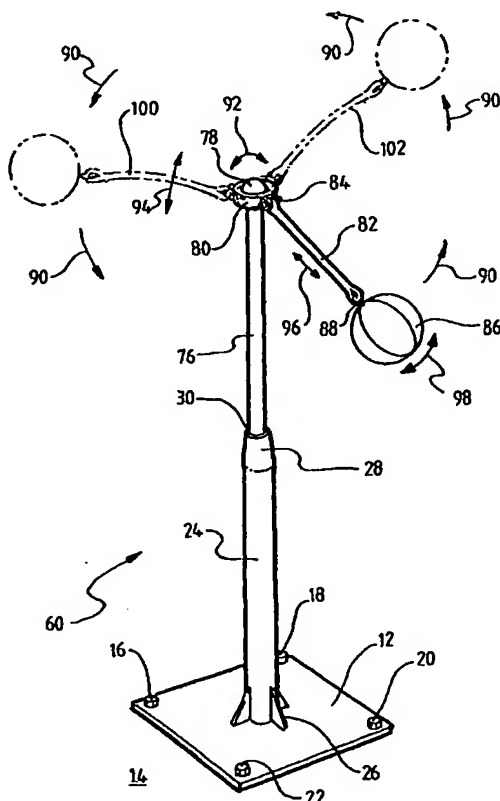
(74) Agent: LESICAR PERRIN; 49 Wright Street, Adelaide, S.A. 5000 (AU).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: AN EXERCISE TRAINING APPARATUS



(57) Abstract: The present invention relates to an exercise training apparatus and more specifically to a martial arts/boxing training apparatus which overcomes the problems associated with existing devices in that it provides the user with the ability to hone in on skills such as speed, power, accuracy and blocking, and also simulate the unpredictable nature of a real-life sparring partner. The apparatus includes a base plate for mounting the apparatus to a surface, a support member, and one or more padded balls that are adapted to move about the support member through connecting arms whose height is adjustable. In one form of the invention, the arms are rigid structures which rotate in a horizontal plane about the support member whereby the length of each arm is adjustable. This embodiment is especially useful when a user wishes to hone in on a particular skill which does not require the element of surprise. In a further form of the invention, the support member includes a flexible arm mounted thereto which is not only capable of rotational movement in a single plane, but is also capable of tiltable and pivotable motion relative to the support member which adds a further dimension to the training apparatus. This embodiment is especially useful when the unpredictable nature of a real-life sparring partner is required.



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

An exercise training apparatus

The present invention relates to an exercise training apparatus and in particular, to an apparatus for use in the development of skills such as speed, accuracy and blocking in various full-contact sports such as boxing and martial arts.

5 BACKGROUND OF THE INVENTION

Boxing, martial arts and other full-contact sports are possibly the most gruelling of any other physical exercise in that they require the sportsman participating to be at peak physical fitness. For example, in the sport of boxing, speed is required so that a fighter can punch an opponent or dodge an opponent's punch as swiftly as possible; power is required so that maximum force can be used when
10 punching; accuracy is required so that when a punch is thrown the boxer has a greater chance of hitting a target; and obviously the skill of blocking is required to avoid being hit in areas such as the face and abdomen.

All of the abovementioned skills require dedicated training and hard work on behalf of the sportsman. These skills have been acquired more easily in recent years through use of training devices.
15 Devices that incorporate contact between a user (usually the fist, foot, knee or elbow) and the striking surface of the device itself have not only removed the need for a physical sparring partner but have also provided the user with a means to hone in on the skill which requires particular attention. Equipment commonplace in most gyms today includes suspended boxing bags, freestanding upright bags, suspended boxing balls (commonly known as speed balls), and double-ended punching balls.

20 Boxing bags are heavy, padded, and cylindrically shaped bags suspended from the ceiling. Upon being punched, the bag generally sways slightly due to its weight and provides the user with little element of surprise on its return stroke. It is for this reason that heavy suspended boxing bags are generally used to help the user in increasing their power or to simply practise the style of their punch.

Freestanding upright bags, like suspended bags, are heavy, padded and cylindrically shaped.
25 However, instead of being suspended from the ceiling they are springedly mounted to the ground. A freestanding upright bag serves virtually the same purpose as a suspended bag and use of the bag does little to develop skills in the boxer.

A suspended boxing ball or 'speed ball' is a tear-drop shaped, padded bag suspended underneath a flat platform at around head-height. The bag is allowed pivotal motion in any direction beneath the
30 platform. For example, when the bag is punched it swings upwards, hits the platform and rebounds back to either receive the user's next punch or hit the front side of the platform and then receive a punch depending on the routine of the user. The user then generally performs a rapid repetition of this motion,

thereby practising both speed and accuracy. There is no movement of the suspended location of the ball and therefore, once again, there is no element of surprise as to where the ball will return once hit.

Double-ended punching balls are generally spherical padded balls which are elastically tethered at their top and bottom poles to a top platform and a bottom platform respectively. When the ball is punched, the movement more closely resembles the unpredictable nature of a returning punch from an opponent in that the ball is now allowed to move in a vertical plane, that is to the left and right of the user as well as backwards and forwards. This device allows the user to improve skills such as speed and accuracy and also defensive skills such as blocking.

There are currently no devices known to the applicant allowing the user to simultaneously improve on skills such as speed, accuracy and blocking whereby a target, typically balls are positioned and configured so that, when struck, a simulation of both the high and low targets and the high and low counter punches of a real-life sparring partner occurs.

There are further no current devices known to the applicant which enable three-dimensional movement of the ball once struck, that is rotational, tiltable and pivotable motion, thereby providing the user with the unpredictable nature of a real life opponent.

It is therefore an object of the present invention to overcome at least some of the aforementioned problems or to provide the public with a useful alternative.

SUMMARY OF THE INVENTION

Therefore in one form of the invention there is proposed an exercise training apparatus including:
a base member adapted to be attached to a surface;
a support member extending from said base member;
at least one arm rotatably attached to said support member; and
a ball attached to a free end of the arm.

Preferably said arm is further tiltable attached to said support member.

Preferably said arm is further pivotably attached to said support member.

Advantageously said arm is rotatably and/or tiltable and/or pivotably attached to said support member.

Preferably said arm is constructed of a resilient material.

Preferably said arm is of an elasticity which allows for tension and compression of said resilient arm.

In preference said arm includes a first arm member and a second arm member, said first arm member adapted to slidably engage said second arm member.

Preferably said arm includes an arm locking means adapted to lock said first arm member and said second arm member relatively. This allows the user to set each arm of the apparatus at their desired
5 level so that differing reaches of an opponent may be simulated.

Preferably said ball is mounted to a free end of said second arm member.

Preferably said support member includes a first member and a second member said first member fixedly attached to said base and adapted to slidably engage said second member.

In preference said support member includes a locking means adapted to lock the second member
10 within the first member. This gives the user the option of height adjustment.

Advantageously said ball is made up of a soft, padded material. This ensures that the ball will not harm the user.

In a further form of the invention there is proposed an exercise training apparatus including:
a base plate adapted to be mounted to a surface;
15 a hollow, cylindrical support member extending outwards from said base plate;
a shaft that is slidable within said support member and lockable there along;
at least one practice component rotatably mounted at a predetermined height along said shaft said
practice component including a first arm and a second arm, said first arm adapted to slidably engage said
second arm; and
20 a ball attached to a free end of said second arm.

Preferably said practice component is further pivotably mounted along said shaft.

Preferably said practice component is further tiltably mounted along said shaft.

Advantageously said practice component is rotatably and/or pivotably and/or tiltably mounted
along said shaft.

25 In preference said practice component includes a circular bearing which is journaled around an outer surface of said shaft and provides for smooth movement of said component.

In a still further form of the invention there is proposed an exercise training apparatus including:
a base plate adapted to be mounted to a surface;
a hollow, cylindrical support member extending outwards from said base plate;
30 a shaft that is slidable within said support member and lockable there along;
at least one resilient arm rotatably, pivotably and tiltably mounted at a predetermined height along said

shaft providing for chaotic three dimensional movement of said arm with respect to said shaft; and a ball attached to a free end of said resilient arm.

Preferably said resilient arm includes a circular bearing which is journaled around an outer surface of said shaft and provides for smooth movement of said arm.

5 BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several implementations of the invention and, together with the description, serve to explain the advantages and principles of the invention. In the drawings,

10 Figure 1 is a schematic perspective view illustrating an exercise training apparatus in accordance with the invention; and

Figure 2 is a schematic perspective view illustrating an exercise training apparatus according to a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 The following detailed description of the invention refers to the accompanying drawings. Although the description includes exemplary embodiments, other embodiments are possible, and changes may be made to the embodiments described without departing from the spirit and scope of the invention. Wherever possible, the same reference numbers will be used throughout the drawings and the following description to refer to the same and like parts.

20 Figure 1 illustrates the training apparatus 10 in accordance with the present invention. A base plate 12 is fixedly mounted to a flat surface 14 using bolts 16, 18, 20 and 22 located at the four corners of the plate 12. Extending upwardly from the plate 12 is a cylindrical support member 24 which is preferably welded to the base plate 12 at a lower end thereof and includes reinforcing elements 26 for added stability. The support member 24 includes an inwardly chamfered upper end 28 defining an opening 30 into which a cylindrical shaft 32 is adapted to be inserted when assembling the training
25 apparatus 10. The cylindrical shaft 32 is adapted to be locked within support member 22 by using any adequate locking means, such as a screw-type vice (not shown) which is well known in the art. Alternatively, the shaft 32 may include a male threaded section (not shown) adapted to engage a female threaded section (not shown) within the support member 22.

30 It is to be understood that the methods of connection as described herein are by way of example only, and the present invention is not intended to be limited to any one of these methods. For example, bolts 16, 18, 20 and 22 may well be replaced by a suction means on the underside of base plate 11 or other suitable fixing means.

It should be further understood that base plate 12 need not be fixed to the ground and may just as well be fixed to a wall or platform (not shown). This would provide the user of the apparatus 10 with further options as to the type of training they wish to undertake. For example, when mounted to the wall, instead of the apparatus 10 as shown in Figure 1 functioning in a horizontal plane, it would
5 function in a vertical plane. Another option would be to attach the apparatus 10 to the ceiling. In fact, the apparatus could be fixed to any surface that corresponds with the training requirements of the user.

Since boxing and martial arts exercises involve the powerful striking of the apparatus whether it be a punch, kick, elbow or knee, the base plate 12 is preferably made of strong, heavy metal such as steel so as to lower the centre of gravity of the apparatus 10. However, the invention should not be
10 limited to only this configuration. For example, a wide hollow base (not shown) could be used whereby an internal chamber is filled with water or sand to thereby stabilise the apparatus. This may even provide a further favourable unpredictability to the user in that the entire apparatus may be designed to sway.

A lower punching component 34 and an upper punching component 36 are rotatably connected
15 to shaft 32 such that shaft 32 extends through central apertures 38 and 40 of each component 34 and 36 respectively. Although not shown, the apparatus 10 includes stopping means for locking each component 34 and 36 at a particular height along the shaft 32 whilst allowing each component to rotate freely at that particular height.

The lower component 34 includes a circular housing 42 enclosing an annular roller bearing (not
20 shown) or the like, which defines aperture 38 allowing the component 34 to freely rotate about the central shaft 32. Two identical arms 44 and 46 are connected, preferably by means of a weld, to the housing 42 and extend outwardly at opposite ends thereof. Arm 44 includes two members 44a and 44b of stepped down cross-sectional size such that member 44b is slidable within member 44a. This configuration allows the user to adjust the reach of the apparatus.

Bolt 44c locks the members 44a and 44b in relative position to each other. As mentioned, arm
25 46 is identical in its configuration to arm 44, i.e. member 46b slides within arm 46a with bolt 46c once again locking the arms in relative position to each other. Spherical balls 48 and 50 are fixedly attached to the ends of arms 44 and 46 respectively through corresponding annular support members 52 and 54 respectively. The balls 48 and 50 effectively act as the target surface when punching is being practised
30 and as a return punch when blocking is being practised.

The upper component 36 comprises substantially identical features to the lower component 34 however, as is illustrated in Figure 1, the upper component 36 includes three identical arms 56, 58 and 60 disposed equally around a central circular housing 62. Those skilled in the art should recognise that each component may include any number of arms disposed about their central housings. Furthermore,

rather than shaft 32 being fixed within the support member 24 and having rotating elements mounted thereto, the support member 24 itself may include the required components for rotation such that the whole of shaft 32 is rotatable within the support member 24.

Once again, housing 62 encloses a circular bearing (not shown) defining aperture 40 allowing the housing 62 to rotate freely about the central shaft 32. Each of the arms 56, 58 and 60 include the same slidable configuration as explained above and have therefore been numbered accordingly but not described here for the purpose of succinctness. Arms 56, 58 and 60 also include respective spherical balls 64, 66 and 68 fixedly attached to their ends by means of annular supports 70, 72 and 74 respectively.

It should now be apparent to those skilled in the art that the present invention can simulate the actions of a real-life sparring partner whereby when a ball is punched, the component 34 or 36 to which the ball is attached effectively rotates about the central shaft 32. If the user wishes to practise a blocking technique, he/she can block the oncoming stream of other balls which follow in the path of rotation. If the user wishes to practise a punching technique, he/she can continue to punch the return balls thereby testing both speed and accuracy. The apparatus 10 is especially effective because it includes two components, one 34 at waist height and the other 36 at head height which are the two areas most likely to be targets in the sport of boxing.

It is to be understood that the heights of shaft 32, lower punching component 34 and upper punching component 36 are adjustable to suit the height of the user. This is also of benefit when storing the apparatus 10 away after use in that when all three of the abovementioned members are at their lowest positions, the height of the entire apparatus is almost halved. Furthermore, the components 34 and 36 can also be dismantled from the central shaft 32.

A further embodiment of the present invention is illustrated in Figure 2. As can be seen, the base plate 12 and supporting member 24 are identical to that shown in Figure 1 and it is for this reason that the numbers referencing these components appear identical.

Figure 2 illustrates a training apparatus 60. A central cylindrical shaft 76 is housed within support member 22 as in the first embodiment however shaft 76 now terminates into a spherical bulb 78 at its upper end. An annular housing 80 which encloses a circular bearing (not shown) is adapted to not only revolve around bulb 78 in a vertical plane (yaw) but is now also capable of tilt or roll around the outer surface of the spherical bulb 78 thereby enabling multi-axial movement.

Attached to housing 80 is an elastic tether 82 which pivots vertically about a horizontally extending clip 84. The elastic tether 82 is attached to a spherical ball 86 preferably by a simple looped connection 88 such that the ball 86 is capable of slight movement about the loop connection 88 when struck, as those skilled in the art would realise.

Figure 2 further illustrates the various forms of motion 90, 92, 94, 96 and 98 of the ball 86, tether 82 and housing 80 using dashed lines which indicate the position of the ball 86, tether 82 and housing 80 at two alternate positions 100 and 102 along its path. This movement occurs due to the combination of simple rotation 90 of the housing 80, tilt or roll 92 of the housing 80, pivot 94 of the tether 82 about clip 84, elongation 96 of the tether 82, and slight movement 98 of the ball 86 allowing for a three-dimensional almost unpredictable or chaotic motion of the ball, features of which are common to those of a human opponent.

It should also be made aware that features of one embodiment may well be combined with features of another. For example, a user may well construct a training apparatus having a three-dimensional punching component (as in Figure 2) attached at the top of the apparatus, and simply a horizontally rotating component (as in Figure 1) attached at waist height.

The various forms of motion described in the present invention, and more particularly the motion of the arms about the shaft, may be achieved using a wide variety of different joining components. For example, rotation of the arms may be achieved by using a simple ball bearing, needle bearing or bush arrangement as well as the roller bearing arrangement as described. Pivot may be achieved using any swivel joint arrangement while tilt or roll of the arms may be achieved by using any form of rotary joint such as ball and socket joints, universal joints, or even CV joints and washers. It is to be understood that the present invention is not intended to be limited to any one of these components but rather the type of motion performed by such components.

Those skilled in the art should now realise how the present invention will aid a boxer, martial artist or any other form of fighter in sharpening his/her skills in regard to speed, accuracy and blocking techniques in that the apparatus effectively simulates a human sparring partner. The boxing balls located on the apparatus can either be continuously punched to test speed and accuracy, be blocked so as to simulate a counter-punch or both so that all skills can be tested.

Further advantages and improvements may very well be made to the present invention without deviating from its scope. Although the invention has been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope and spirit of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

In any claims that follow and in the summary of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprising" is used in the sense of "including", i.e. the features specified may be associated with further features in various embodiments of the invention.

5

PAGE INTENTIONALLY LEFT BLANK

CLAIMS

1. An exercise training apparatus including:
a base member adapted to be attached to a surface;
a support member extending from said base member;
5 at least one arm rotatably attached to said support member; and
a ball attached to a free end of the arm.
2. An exercise training apparatus as in claim 1 wherein said arm is further tiltably attached to said support member.
3. An exercise training apparatus as in claim 1 wherein said arm is further pivotably attached to
10 said support member.
4. An exercise training apparatus as in claim 1 wherein said arm is rotatably and/or tiltably and/or pivotably attached to said support member.
5. An exercise training apparatus as in any one of claims 1-4 wherein said arm is constructed of a resilient material.
6. An exercise training apparatus as in claim 5 wherein said arm is of an elasticity which allows for
15 tension and compression of said tethered arm.
7. An exercise training apparatus as in any one of claims 1-4 wherein said arm includes a first arm member and a second arm member, said first arm member adapted to slidably engage said second arm member.
8. An exercise training apparatus as in claim 7 wherein said arm includes an arm locking means
20 adapted to lock said first arm member and said second arm member relatively.
9. An exercise training apparatus as in claim 8 wherein said ball is mounted to a free end of said second arm member.
10. An exercise training apparatus as in any one of the above claims wherein said support member
25 includes a first member and a second member said first member fixedly attached to said base and adapted to slidably engage said second member.
11. An exercise training apparatus as in claim 10 wherein said support member includes a locking means adapted to lock the second member within the first member.
12. An exercise training apparatus as in any one of the above claims wherein said ball is made up of
30 a soft, padded material.

13. An exercise training apparatus including:

a base plate adapted to be mounted to a surface;

a hollow, cylindrical support member extending outwards from said base plate;

a shaft that is slidable within said support member and lockable there along;

at least one practice component rotatably mounted at a predetermined height along said shaft

said practice component including a first arm and a second arm, said first arm adapted to

slidably engage said second arm; and

a ball attached to a free end of said second arm.

14. An exercise training apparatus as in claim 13 wherein said practice component is further pivotably mounted along said shaft.

15. An exercise training apparatus as in claim 13 wherein said practice component is further tiltably mounted along said shaft.

16. An exercise training apparatus as in claim 13 wherein said practice component is rotatably and/or pivotably and/or tiltably mounted along said shaft.

17. An exercise training apparatus as in any one of claims 13-16 wherein said practice component includes a circular bearing which is journaled around an outer surface of said shaft and provides for smooth movement of said component.

18. An exercise training apparatus including:

a base plate adapted to be mounted to a surface;

a hollow, cylindrical support member extending outwards from said base plate;

a shaft that is slidable within said support member and lockable there along;

at least one resilient arm rotatably, pivotably and tiltably mounted at a predetermined height

along said shaft providing for chaotic three dimensional movement of said arm with respect to

said shaft; and

a ball attached to a free end of said resilient arm.

19. An exercise training apparatus as in claim 18 wherein said resilient arm includes a circular bearing which is journaled around an outer surface of said shaft and provides for smooth movement of said arm.

1/2

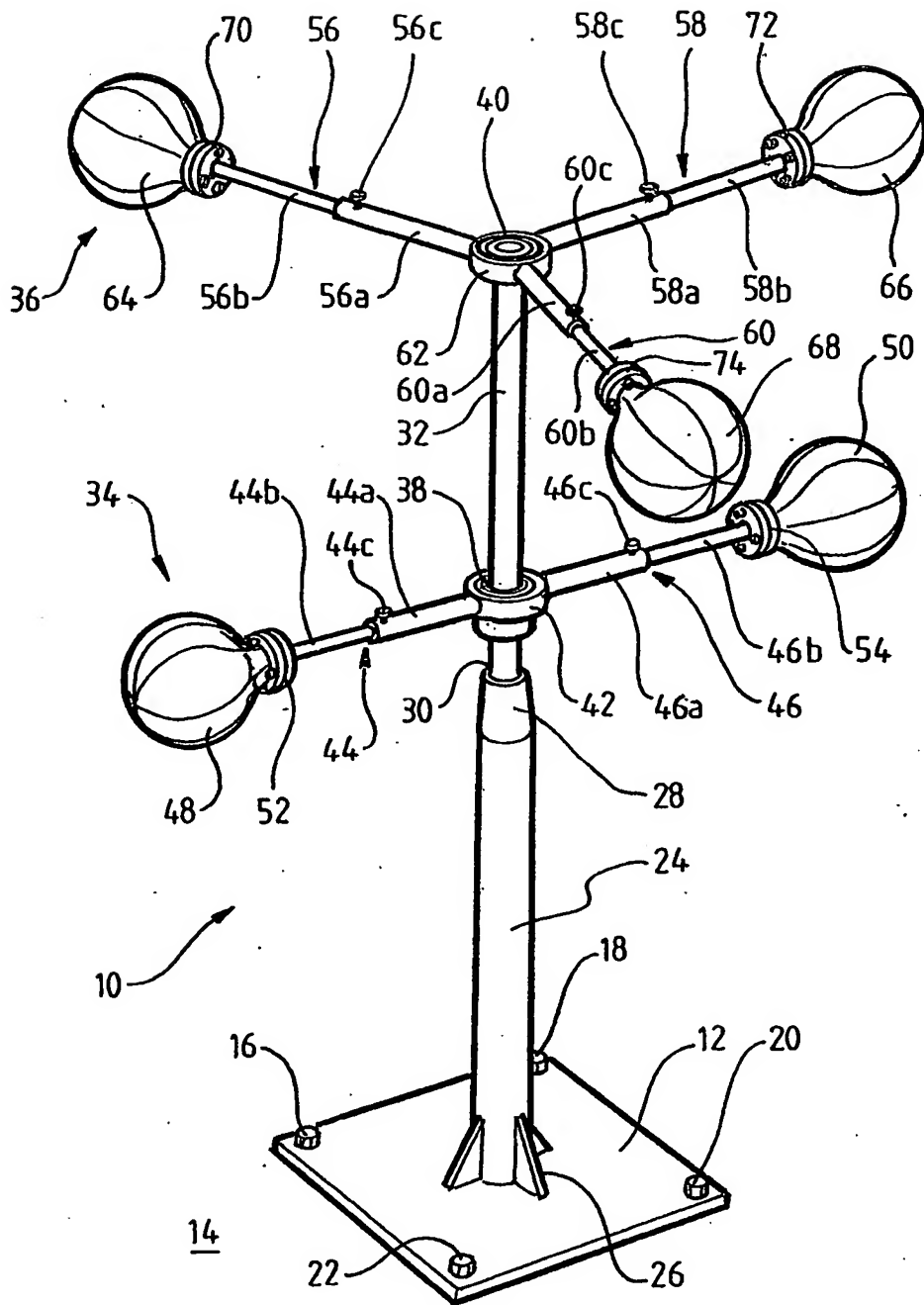


Fig 1

2/2

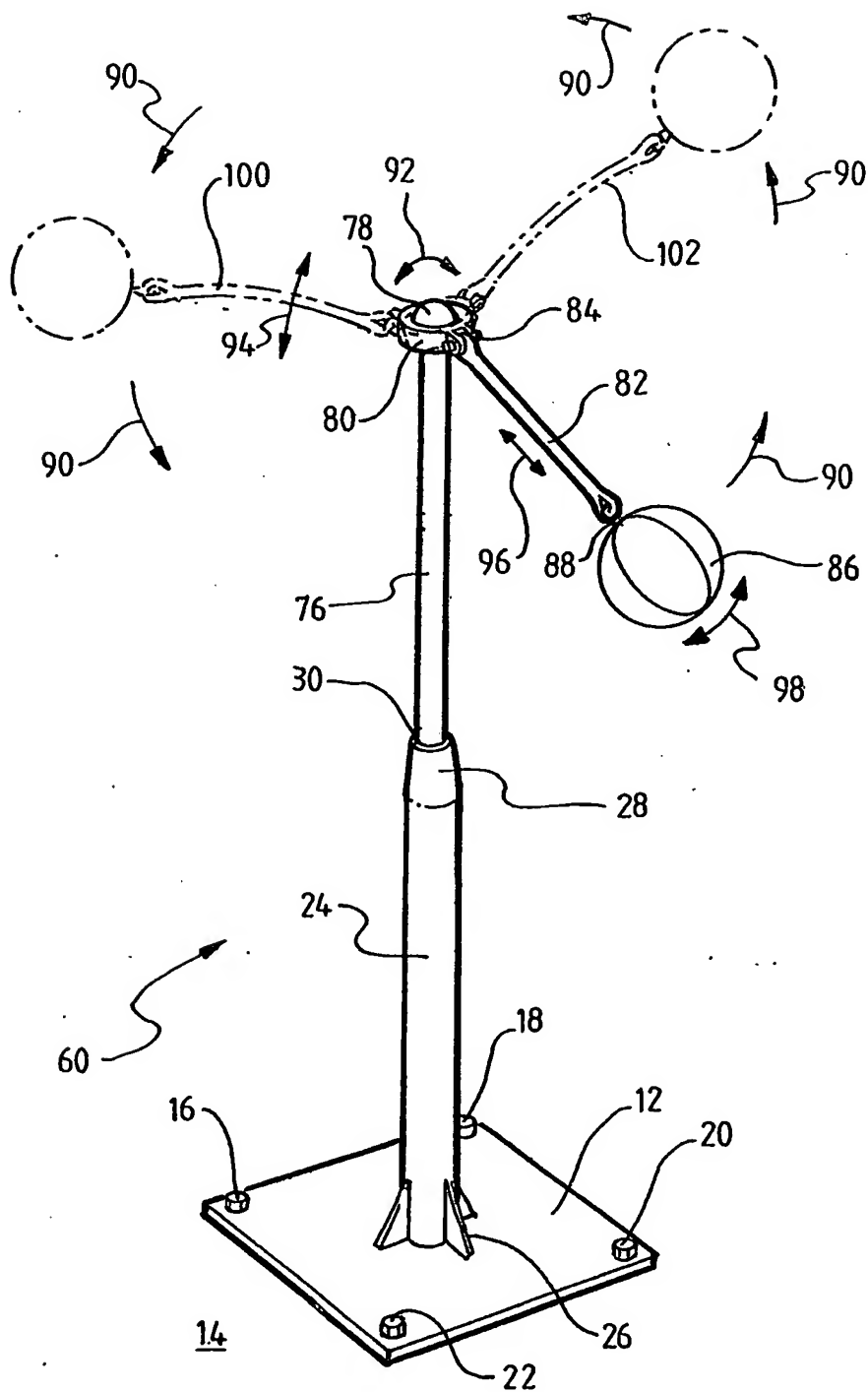


Fig 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/000566

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁷ : A63B 69/24, 69/20, 69/30, 69/34 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT: A63B 21/-, 22/-, 23/-, 69/2+, 69/30, 69/32, 69/34 and keywords (boxing or boxer+ or punch+)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	Derwent Abstract Accession No. 82-p6027e, class P36 DE 3208044 A (VEB KOMB WALZLAGER) 4 November 1982 See, especially: the abstract and Figure 1	1-9, 12 13-16
X Y	GB 2205509 A (HOGG) 14 December 1988 See, especially: the abstract; figures; page 2, lines 14-18; page 4, lines 13-17	1, 4, 10-13, 17 13-17
X Y	US 6077204 A (DICKINSON, Jr) 20 June 2000 See, especially: the abstract; figures	1-6, 10-12 13-16
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 19 July 2004		Date of mailing of the international search report 30 JUL 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer ROSEMARY LONGSTAFF Telephone No : (02) 6283 2637

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/000566

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4434980 A (BABINEAUX) 6 March 1984 See, especially: the abstract; figures; column 2, lines 47-57	1-6, 12
X Y	US 5735775 A (MIASSERIAN) 7 April 1998 See, especially: the abstract; figures	1, 4, 10, 12 13-17
X Y	US 2002/0013198 A (MACKAY et al.) 31 January 2002 See, especially: the abstract; figures	1, 4, 10, 12 13-16
Y	SU 1613123 A (TASHTAGOLSK SIBRUDA) 7 December 1990 See, especially: the abstract; figure	13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2004/000566

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
DE	3203044	DD	157537
GB	2205509		
US	6077204		
US	4434980		
US	5735775	US	5613925
US	2002013198		
SU	1613123		
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			
END OF ANNEX			